Power Hybrid Circuits

Product Guide

RCA

PHC-600

This new Product Guide contains abbreviated data on RCA's line of Power Hybrid Circuits. Data are shown for linear amplifiers, series voltage regulators, Darlington-type circuits, high-current arrays, and "building blocks".

RCA Power Hybrid circuits consist of a combination of active solid-state devices (power transistors, diodes, and monolithic integrated circuits) and passive components (resistors and capacitors) all interconnected within a single compact package to provide a specific circuit function. The use of one functional circuit package to replace a number of discrete components usually results in more compact, lighter-weight equipment design. The use of the modular concept in circuit design also simplifies equipment assembly and servicing.

Complete data on specific devices can be obtained by reference to the data bulletin (listed by file number), or the developmental data sheet (by TA number). The data bulletins and application notes listed are available by request to RCA Solid State Division, Box 3200, Somerville, N. J. 08876. For further information, contact your local RCA Sales Office.

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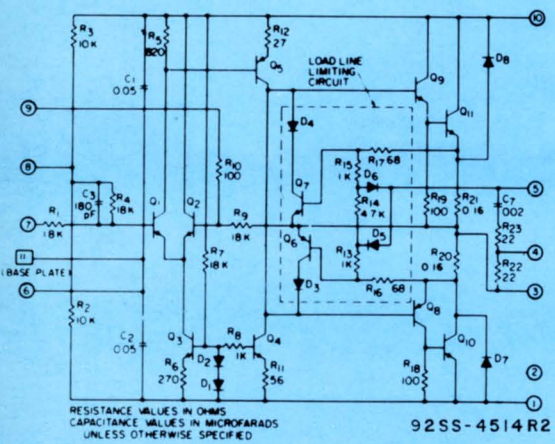
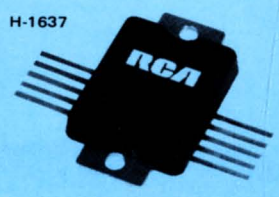
Printed in USA|3-72

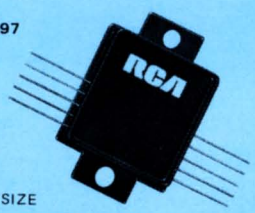
Linear Amplifiers|HC1000, HC1000H – 7-Ampere Power Amplifier



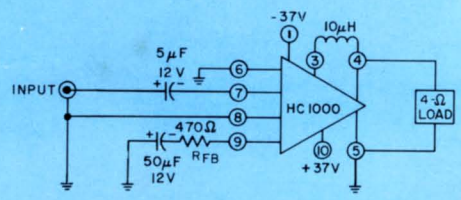
Schematic diagram of type HC1000 power-hybrid-circuit power amplifier.



H-1637
1/3 SIZE
HC1000 (Plastic)

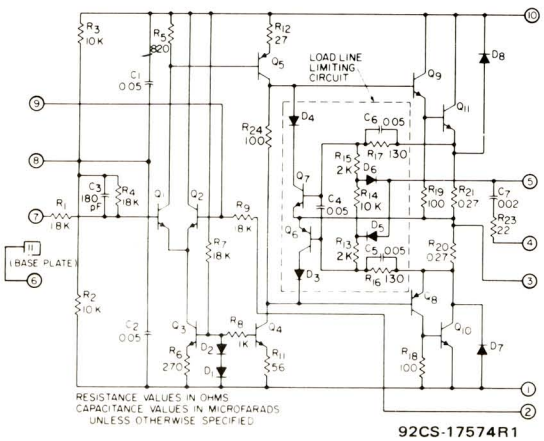


H-1697
1/3 SIZE
HC1000H (Hermetic)

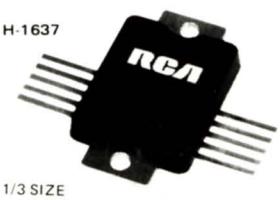


Typical connection for HC1000 for use as an audio amplifier with split power supply and direct-coupled load.

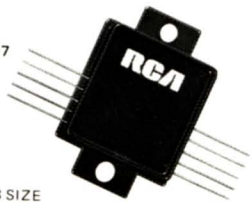
Linear Amplifiers|HC2000, HC2000H – 7-Ampere Operational Amplifier



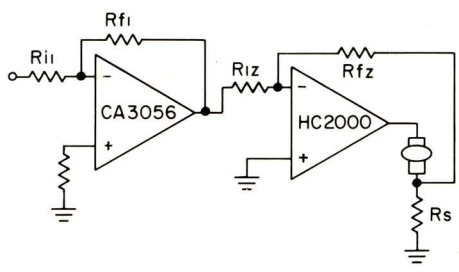
Schematic diagram of type HC2000 power-hybrid-circuit operational amplifier.



H-1637
1/3 SIZE
HC2000 (Plastic)



H-1697
1/3 SIZE
HC2000H (Hermetic)



Typical connection for HC2000 for use as a dc servo motor-control.

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Developmental-type devices or materials are intended for engineering evaluation. The type designation and data are subject to change, unless otherwise arranged. No obligations are assumed for notice of change or future manufacture of these devices or materials.

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Applications

- Servo amplifiers (AC, DC, PWM)
- Deflection amplifiers
- Audio amplifiers
- Voltage regulators
- Driven inverters

Features

- High-power output—up to 100 W
- Average power dissipation per output trans.—35 W
- Built-in load-line limiting circuit
- Single or split power supply

Electrical Characteristics, $T_C = 25°C$

Total Harmonic Distortion (P_O = 60 W, R_L = 4Ω)	THD	0.5% max.
Bandwidth (P_O = 1 W, R_L = 4Ω)	f_H	43 kHz min.
Input Impedance	Z_{IN}	18 kΩ typ
Quiescent Current	I_O	15-30 mA
Short-Circuit Current	I_S	2-3 A

Data Bulletin File No. 565

Available application note(s), see page 9

HC1000H utilizes a hermetic package and is intended for critical industrial and military applications.

HC1000 was formerly RCA Dev. type TA7625.

HC1000H was formerly RCA Dev. type TA7626.

Applications

- Servo amplifiers (AC, DC, PWM)
- Deflection amplifiers
- Power operational amplifiers
- Audio amplifiers
- Voltage regulators
- Driven inverters

Features

- High-power output up to 100 W
- Average power dissipation per output trans. —35 W
- Built-in load-line limiting circuit
- Single or split power supply
- Terminal for external feedback

Electrical Characteristics, $T_C = 25°C$

Total Harmonic Distortion (P_O = 60 W, R_L = 4Ω)	THD	0.5% max.
Bandwidth (P_O = 1 W, R_L = 4Ω)	f_H	43 kHz min.
Input Impedance	Z_{IN}	18 kΩ typ.
Quiescent Current	I_O	15-30 mA
Short-Circuit Current	I_S	2-3 A

Data Bulletin File No. 566

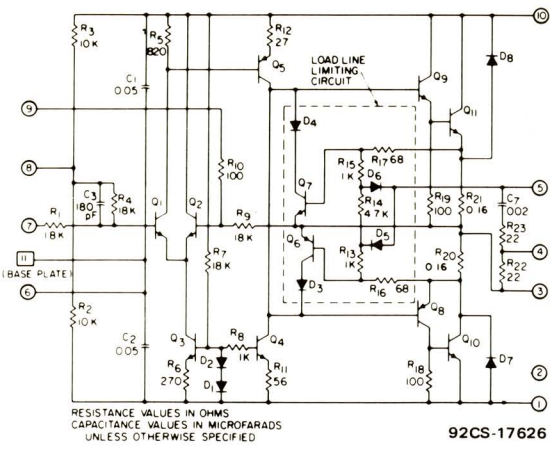
Available application note, see page 9

HC2000H utilizes a hermetic package and is intended for critical industrial and military applications

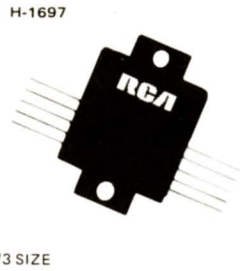
HC2000 was formerly RCA Dev. type TA7625A.

HC2000H was formerly RCA Dev. type TA7626A.

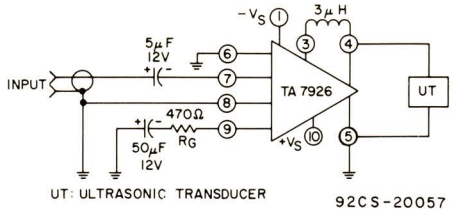
Linear Amplifiers | TA7926 – 7-Ampere Power Amplifier



Schematic diagram of type TA7926 power-hybrid-circuit power amplifier.

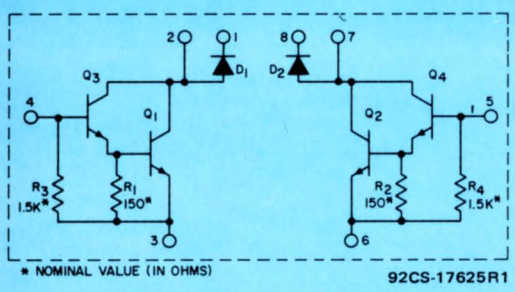


TA7926 (Hermetic)

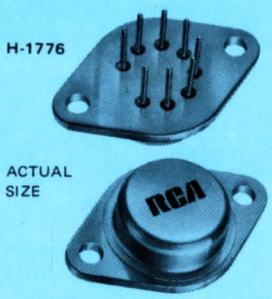


Typical connection for TA7926 for use as an ultrasonic amplifier.

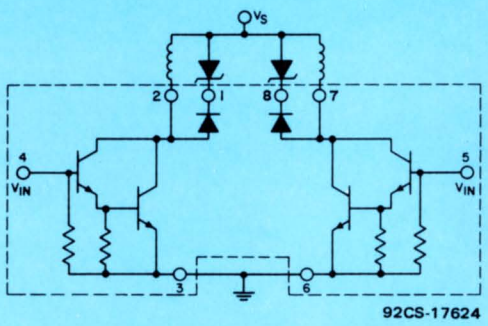
Dual Darlingtons | HC3000 – High-Gain , Current-Amplifier Pair



Schematic diagram of type HC3000 power hybrid circuit.

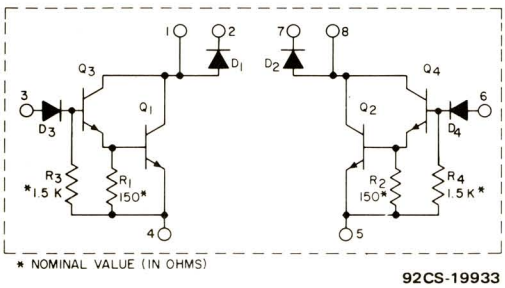


HC3000 8-Pin TO-3



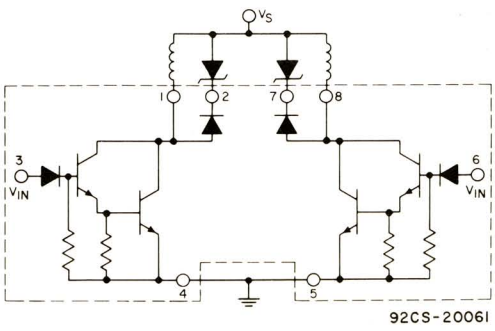
Typical connection for HC3000 for use as a hammer driver.

Dual Darlingtons | HC3100 – High-Gain , High-Voltage Current-Amplifier Pair



Schematic diagram of type HC3100 power hybrid circuit.

HC3100 8-Pin TO-3



Typical connection for HC3100 for use as a hammer driver.

Applications

- Sonar amplifiers
- Deflection amplifiers
- Ultrasonic amplifiers

Features

- High-power output up to 100 W
- Average power dissipation per output trans. —35 W
- Built-in load-line limiting circuit
- Single or split power supply

Electrical Characteristics, $T_C = 25°C$

Total Harmonic Distortion (P_O = 30 W, R_L = 3Ω)	THD	5% max.
Bandwidth (P_O = 60 W, R_L = 4Ω)	f_H	DC to 100 kHz
Input Impedance	Z_{IN}	18 kΩ typ.
Quiescent Current	I_O	30 mA max.
Short Circuit Current	I_S	5 A max.

Applications

- Hammer driver
- Solenoid driver
- Stepper-motor driver
- Regulators

Features

- Two isolated Darlington circuits
- Integral diodes for commutating inductive loads
- High current gain
- Rugged hometaxial-base output transistors

Electrical Characteristics, $T_C = 25°C$ (per circuit)

Collector-to-Emitter Sustaining Voltage (with base open)	70 V min.
DC Forward-Current Transfer Ratio:	
(V_{CE} = 2 V, I_C = 3 A)	600 min.
(V_{CE} = 4 V, I_C = 5 A)	500 min.
Collector-to-Emitter Saturation Voltage (I_C = 3 A, I_B = 0.006 A)	1.7 V max.
Power Rating Test (V_{CE} = 10 V, I_C = 2 A)	1 s min.

Data Bulletin File No. 539
Socket: RCA DF-263A
HC3000 was formerly RCA Dev. type TA8141

Applications

- Hammer driver
- Solenoid driver
- Stepper-motor driver
- Regulators

Features

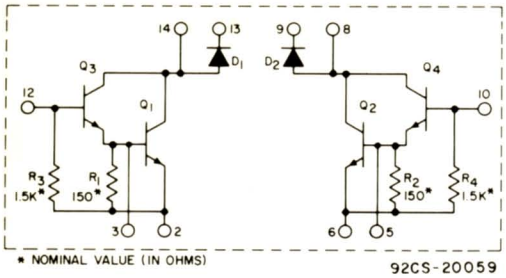
- Two isolated Darlington circuits
- Integral diodes for commutating inductive loads
- High current gain
- Rugged hometaxial-base output transistors

Electrical Characteristics, $T_C = 25°C$ (per circuit)

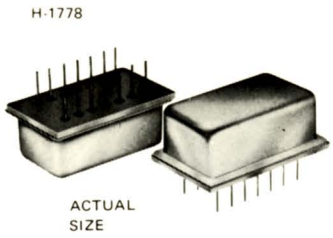
Collector-to-Emitter Sustaining Voltage (with base open)	120 V min.
DC Forward-Current Transfer Ratio:	
(V_{CE} = 2 V, I_C = 2A)	650 min.
Collector-to-Emitter Saturation Voltage (I_C = 2A, I_B = 0.004 A)	1.7 V max.
Power Rating Test (V_{CE} = 10 V, I_C = 2 A	1 s min.

Data Bulletin File No. 564
Socket: RCA DF-263A
HC3100 was formerly RCA Dev. type TA8241

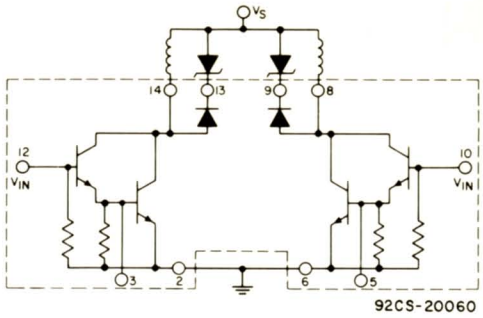
Dual Darlingtons | TA8590 High-Gain Current-Amplifier Pair



Schematic diagram of type TA8590 power hybrid circuit.



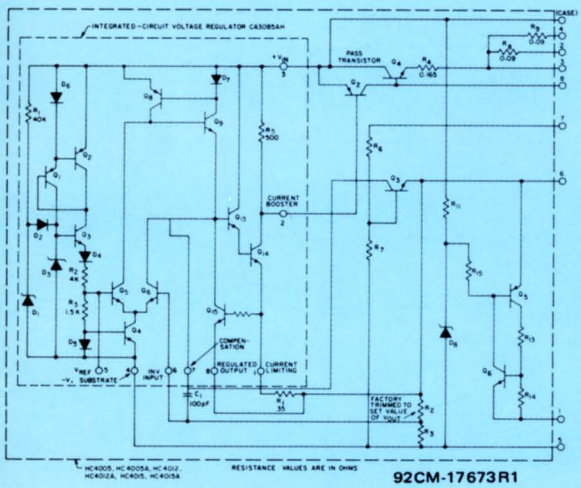
TA8590 14-Lead Dual-In-Line



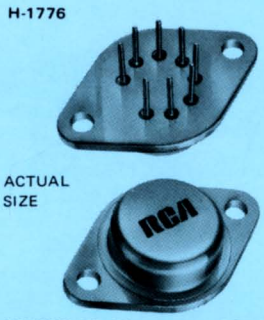
Typical connection for TA8590 for use as a hammer driver.

Series Voltage Regulators | HC4005, HC4005A, HC4012, HC4012A, HC4015, HC4015A

5-, 12-, & 15-V Series-Voltage Regulators
1% Regulation — HC4005A, HC4012A, HC4015A
3% Regulation — HC 4005, HC4012, HC4015

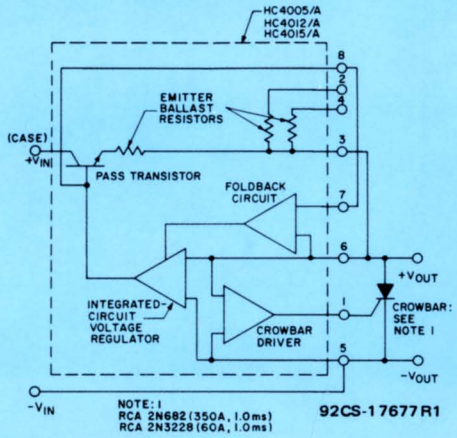


Schematic diagram of types HC4005/A, HC4012/A, and HC4015/A power-hybrid-circuit series voltage regulators.



HC4005, 12, 15 8-Pin TO-3

TYPE	V_{OUT}	R_6	R_7	R_3	R_{11}	R_{15}	R_{13}	R_{14}	D_8
HC4005/A	5.0	760	4.2K	2.2K	1.4K	1K	1K	4K	5.6V
HC4012/A	12.0	1.7K	17K	1150	2.0K	1K	2.7K	1.6K	15.0V
HC4015/A	15.0	1.1K	17K	1150	2.0K	1K	3.7K	1.6K	19.0V



Typical connection for use as a 4-A series regulator.

Arrays

Inverter Arrays
TA7832, TA7835

High-Power, High-Current Output Arrays for dc-to-dc converter or ac inverter applications. TA7832 has a common collector configuration, TA7835 has a common emitter configuration.

Output Arrays
TA7630

300-Ampere Switch Output used where high-current switching is a major design consideration. Typical applications are magnetic vibrator controls, dc motor controls, high-current dc relays in which arcing is not desired, and conventional dc type of switching applications.

Applications

- Hammer driver
- Solenoid driver
- Stepper-motor driver
- Regulators

Features

- Two isolated Darlington circuits
- Integral diodes for commutating inductive loads
- High current gain
- Rugged hometaxial-base output transistors

Electrical Characteristics, T_C = 25°C (per circuit)

Collector-to-Emitter Sustaining Voltage (with base open)	70 V min.
DC Forward-Current Transfer Ratio:	
(V_{CE} = 2 V, I_C = 3 A)	600 min.
(V_{CE} = 4 V, I_C = 5 A)	500 min.
Collector-to-Emitter Saturation Voltage (I_C = 3 A, I_B = 0.006 A)	1.7 V max.
Power Rating Test (V_{CE} = 10 V, I_C = 2 A)	1 s min.
Thermal Resistance:	
Junction-to-case	6 °C/W max.
Junction-to-ambient	50 °C/W max.

Features

- 4-A current rating
- Crowbar trigger circuit
- Internal foldback - protection circuit
- Internal emitter-ballast resistors
- 40-V line-voltage capability
- Remote sensing capability
- Terminal connections to permit connection of regulator as a Darlington driver

Electrical Characteristics, T_C = 25°C (per circuit)

Input-Output Voltage Differential (I_L = 4 A)	4 V min.
Temperature Coefficient of Output Voltage (I_L = 100 mA, -55–100°C)	0.0035%/W typ.
Crowbar Trip Voltage (-55–100°C):	
5 V (V_{OUT})	5.75-7.25 V
12 V (V_{OUT})	13.9-17.3 V
15 V (V_{OUT})	16.6-20.6 V
Crowbar Current	100-135 mA
Foldback Current	4-4.8 A
Short-Circuit Foldback Current	2 A max.

Data Bulletin File No. 571

Available application note, see page 9

Socket: RCA DF-263A

HC4005A, HC4012A, and HC4015A were formerly RCA Dev. types TA7955, TA7956, and TA8397, respectively.

Also available . . .

On request, regulators are also available with no crowbar trigger circuit and with 1 and 3 percent regulation.

TA7929

250-Ampere Darlington Output used in applications which require high gain at a 250-ampere maximum switching current.

TA7863

High-Current Output with individual emitter leads for ballasting. Maximum current per emitter is 50 amperes. This array is ideally suited for shunt regulators or electronic filters in which dissipations up to 800 watts may be handled.

Building Blocks | TA7967, TA7968

Plastic-Encapsulated, Silicon N-P-N, Power Transistors

H-1752

ACTUAL SIZE

Chip in each of these devices is mounted on an alumina ceramic mounting plate to provide collector isolation.

Applications

- Power switching circuits

Features

- Dissipation—50 max. W
- Electrically isolated collector
- Small size for high packing densities
- Suitable for soldering or adhesive mounting
- 5-A collector current rating
- Low saturation voltage—1.1 V at I_C = 4 A

Electrical Characteristics, T_{MS} = 25°C

Collector-to-Emitter Sustaining Voltage (base open):
- TA7967 . . . . . .60 V min.
- TA7968 . . . . . .40 V min.

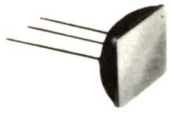
DC Forward Current Transfer Ratio
(V_{CE} = 4 V, I_C = 4 A)
- TA7967 . . . . . 15 min.
- TA7968 . . . . . 20 min.

Gain-Bandwidth Product . . . . . .0.8 MHz min.

Building Blocks | TA8400

High-Voltage, High-Power Plastic-Encapsulated, Silicon N-P-N Power Transistor

H-1752



ACTUAL SIZE

Chip in this device is mounted on a beryllia ceramic mounting plate to provide collector isolation.

Applications

- Power switching circuits

Features

- Dissipation – 100 max. W
- Electrically isolated collector
- Small size for high packing densities
- Suitable for soldering or adhesive mounting
- 3-A collector current rating
- Low saturation voltage – 1.1 V at I_C = 4 A

Electrical Characteristics, T_{MS} = 25°C

Collector-to-Emitter Sustaining Voltage (base open) . . . . . 90 V min.

DC Forward Current Transfer Ratio
(V_{CE} = 4 V, I_C = 3 A) . . . . . 15 min.

Gain-Bandwidth Product . . . . . 0.8 MHz min.

WARNING: The ceramic mounting plate of the TA8400 contains beryllium oxide. Do not crush, grind, or abrade this portion because the dust resulting from such action may be hazardous if inhaled. Disposal should be by burial.

Commercial No./Devel. No. (TA) Cross-Reference Guide

Comm. No.	Title	Former Dev. No. (TA)
HC1000	7-Ampere Power Amplifier (Plastic)	TA7625
HC1000H	7-Ampere Power Amplifier (Hermetic)	TA7626
HC2000	7-Ampere Operational Amplifier (Plastic)	TA7625A
HC2000H	7-Ampere Operational Amplifier (Hermetic)	TA7626A
HC3000	High-Gain Current Amplifier Pair (Darlington)	TA8141
HC3100	High-Gain, High-Voltage Current Amplifier Pair (Darlington)	TA8241
HC4005A	5-V Series-Voltage Regulator	TA7955
HC4012A	12-V Series-Voltage Regulator	TA7956
HC4015A	15-V Series-Voltage Regulator	TA8397

Application Notes for Power Hybrid Circuits

Comm. No.	No.	Title
HC1000	AN-4474	Audio Applications of the RCA-HC1000 Hybrid Linear Power Amplifier
	AN-4483	General application Considerations for the RCA-HC1000 Hybrid Linear Power Amplifier
HC2000	AN-4782	General Application Considerations for the RCA-HC2000 Power Hybrid Operational Amplifier
HC4005/A HC4012/A HC4015/A	AN-6026	General Considerations for Hybrid Series Voltage Regulators

Sales Offices

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Michigan	Detroit	28840 Southfield Rd., Lathrup Village, MI 48076 (313) 557-7555
Minnesota	Minneapolis	6750 France Ave. S., Suite 122, Minneapolis, MN 55435 (612) 929-0676
Kansas Missouri	Kansas City	5750 W. 95th St., Suite 111, Overland Park, KS 66207 (913) 642-7656
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